

What is claimed is:

1. A data transfer system comprising:

a plurality of requesters configured to send data transfer  
5 requests, the requesters configured to transfer data when  
authorized;

a transfer controller configured to receive the data transfer  
requests from the requesters, the transfer controller  
configured to authorize one of the data transfer requests  
10 to perform arbitration for the data transfer requests, the  
transfer controller configured to send a transfer  
directive at a predetermined timing;

a network configured to receive the transfer directive to  
transfer data from an authorized requester based on the  
15 transfer directive; and

a plurality of memories including a plurality of modules,  
each of the modules having data input and output unit, the  
memories configured to receive the transfer directive to  
receive transfer data from the network based on the  
20 transfer directive.

2. The data transfer system as claimed in claim 1, wherein  
the transfer controller performs arbitration for the  
memories then performs arbitration for the network.

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3. The data transfer system as claimed in claim 1, wherein

the data transfer controller performs arbitration for the network then performs arbitration for the memories.

4. The data transfer system as claimed in claim 1, wherein  
5 the transfer controller performs arbitration for the network and arbitration for the memories in parallel.
5. The data transfer system as claimed in claim 1, wherein  
a data width of the network and data input and output width  
10 of the memories are equal.
6. The data transfer system as claimed in claim 1, wherein  
the transfer controller detects that the data transfer requests from the requesters are read access or write access,  
15 then the transfer controller controls the timing to send transfer directives based on the access.
7. The data transfer system as claimed in claim 1, wherein  
the plurality of modules includes a plurality of macros,  
20 the data is divided to be stored by the plurality of macros.
8. The data transfer system as claimed in claim 1, wherein  
the transfer controller controls transferring the data based on a major cycle defined to be at least two clock  
25 cycles.

9. The data transfer system as claimed in claim 1, the transfer controller further comprising:  
a request storing unit configured to receive data transfer requests from the requesters;  
5 an address decoder configured to decode addresses of the data transfer requests stored in the request storing unit;  
a module arbitration unit configured to perform arbitrations of decoded data transfer requests on a per-module basis;  
a network arbitration unit configured to perform arbitrations  
10 of the decoded data transfer requests for allocating the network; and  
a transfer directive generator configured to generate transfer directives related to data transfer requests that is granted authorization to use the network by the module  
15 arbitration unit and network arbitration unit.

10. The data transfer system as claimed in claim 9, wherein the module arbitration unit includes a plurality of module arbiters that hold the decoded data transfer requests for  
20 each memory module.

11. The data transfer system as claimed in claim 10, wherein each of the module arbiters selects a macro that can currently be accessed earliest among the data transfer  
25 requests.

12. The data transfer system as claimed in claim 10, wherein each of the module arbiters selects a data transfer request requesting to an accessible macro based on the response time of the macro.

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13. The data transfer system as claimed in claim 10, wherein each of the module arbiters receives priority information for transferring of the requesters to select a request having the highest priority among the data transfer requests.

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14. The data transfer system as claimed in claim 9, wherein the network arbitration unit allocates, per a major cycle defined to be at least two clock cycles, a network connection of the network to requesters in consideration of read and write cycles based on the number of the buses of the network.

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15. The data transfer system as claimed in claim 2, the transfer controller further comprising:

20 a request storing unit configured to receive data transfer requests from the requesters;

an address decoder configured to decode addresses of the data transfer requests stored in the request storing unit;

25 a module arbitration unit configured to perform arbitrations of decoded data transfer requests on a per-module basis;

a network arbitration unit configured to perform arbitrations of the decoded data transfer requests for allocating the network; and

a transfer directive generator configured to generate  
5 transfer directives related to data transfer requests that is granted authorization to use the network by the module arbitration unit and network arbitration unit.

16. The data transfer system as claimed in claim 15, wherein  
10 the module arbitration unit includes a plurality of module arbiters that hold the decoded data transfer requests for each memory module.

17. The data transfer system as claimed in claim 16, wherein  
15 each of the module arbiters selects a macro that can currently be accessed earliest among the data transfer requests.

18. The data transfer system as claimed in claim 16, wherein  
20 each of the module arbiters selects a data transfer request requesting to an accessible macro based on the response time of the macro.

19. The data transfer system as claimed in claim 16, wherein  
25 each of the module arbiter receives priority information for transferring of the requesters to select a request

having the highest priority among the data transfer requests.

20. The data transfer system as claimed in claim 15, wherein  
5 the network arbitration unit allocates, per a major cycle defined to be at least two clock cycles, a network connection of the network to requesters in consideration of read and write cycles based on the number of the buses of the network.

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